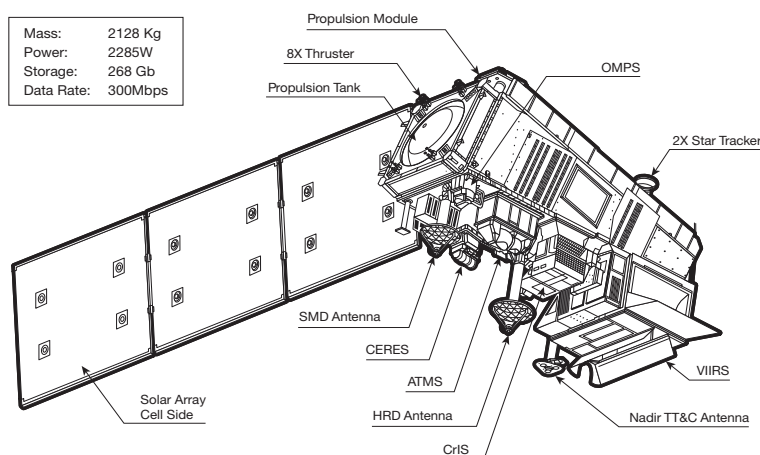


NPOESS Preparatory Project (NPP)

Building a Bridge to a New Era of Earth Observations

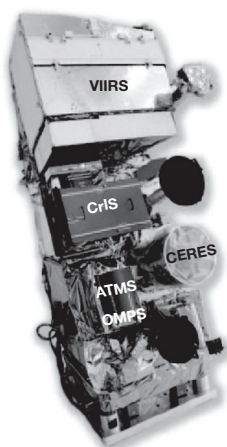
NPP is a NASA satellite that has five instruments that provide critical insights into the dynamics of the entire Earth system including clouds, oceans, vegetation, ice and the atmosphere. NPP stands for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP). Roughly the size of a minibus, NPP orbits the Earth from pole to pole about 14 times a day, flying 512 miles (824 kilometers) above the Earth's surface. NPP sends its data once an orbit to the ground station in Svalbard, Norway and continuously to local direct broadcast users.



NPP Spacecraft and Instruments

VIIRS – Visible Infrared Imaging Radiometer Suite

The largest instrument aboard NPP is the Visible Infrared Imaging Radiometer Suite (VIIRS). It collects radiometric imagery in visible and infrared wavelengths of the land, atmosphere, ice and ocean. Data from VIIRS, collected from 22 channels across the electromagnetic spectrum, are used to observe active fires, vegetation, ocean color, sea surface temperature and other surface features. A variety of scientists study VIIRS data, much of which is used in monitoring the pace and impacts of climate change. Atmospheric scientists use some of these channels to observe clouds and small airborne particles called aerosols. Oceanographers use VIIRS to monitor phytoplankton and sediment in the seas. Terrestrial ecologists use it to monitor forest cover and productivity and ice experts use it to track changes in polar sea ice.



CERES – Cloud and Earth Radiant Energy System

The Clouds and the Earth's Radiant Energy System (CERES) measures both solar energy reflected by the Earth and heat emitted by our planet. This solar and thermal energy are key parts of what's called the Earth's radiation budget. When sunlight hits Earth and its atmosphere, they warm up. Clouds and other light-colored surfaces like snow and ice reflect some of the sun's heat and light, cooling Earth, while additional cooling comes from heat that Earth radiates to

space. It's crucial for scientists to understand this complex Earth radiation budget system. The changing role of clouds in this system is one of the biggest unknowns in climate science. So scientists need long-term, stable data sets to make accurate projections of global climate change. NPP's CERES instrument continues a multi-year record of the amount of energy entering and exiting from the top of Earth's atmosphere. A total of four other CERES instruments fly on the EOS satellites Terra and Aqua.

CrIS – Cross-track Infrared Sounder

The Cross-track Infrared Sounder (CrIS) and the Advanced Technology Microwave Sounder (ATMS) work together, providing global high-resolution profiles of temperature and moisture. These advanced atmospheric sensors create cross-sections of storms and other weather conditions, helping with both short-term 'nowcasting' and long-term forecasting, while adding to scientists' understanding of major climate phenomena like El Niño events. CrIS measures continuous channels in the infrared region and has the ability to measure temperature profiles with improved accuracy over its predecessor instruments on operational satellites, and comparable accuracy to the Atmospheric Infrared Sounder (AIRS) on Aqua. NOAA will be using CrIS for numerical weather prediction and, because it is a brand new instrument, its use on NPP provides a real-world test of the equipment before NOAA's upcoming Joint Polar Satellite System (JPSS) missions.

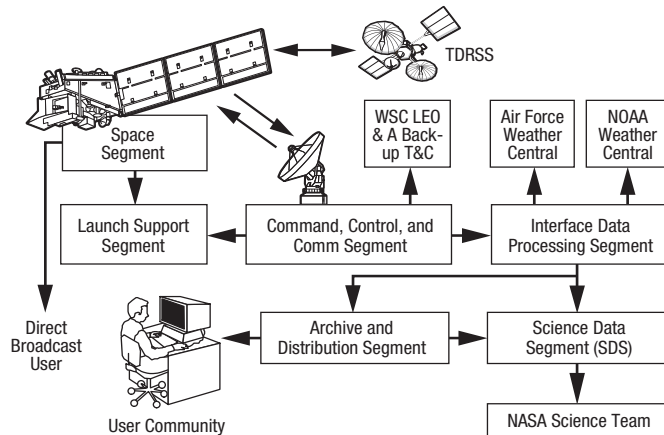
ATMS – Advanced Technology Microwave Sounder

The Advanced Technology Microwave Sounder (ATMS) works in both clear and cloudy conditions, providing high-spatial-resolution microwave measurements of temperature and moisture. ATMS has better sampling and two more channels than previous instruments like the Advanced Microwave Sounding Units (AMSU), and it combines all of their abilities into one instrument. Working in concert, CrIS and ATMS together comprise the Cross-track Infrared Microwave Sounding Suite (CrIMSS).

OMPS – Ozone Mapping and Profiler Suite

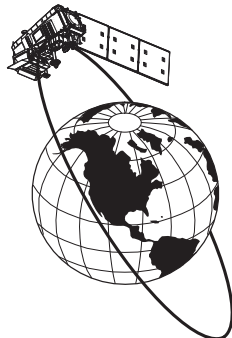
The Ozone Mapping and Profiler Suite measures the ozone layer in our upper atmosphere—tracking the status of global ozone distributions, including the ‘ozone hole.’ It also monitors ozone levels in the troposphere, the lowest layer in our upper atmosphere—tracking the status of global ozone distributions, including the ‘ozone hole.’ It also monitors ozone levels in the troposphere, the lowest layer of our atmosphere. OMPS extends out 40-year long record ozone layer measurements while also providing improved vertical resolution compared to two sensors, both new designs, composed of three advanced measurements of harmful ozone improve air quality monitoring and when combined with cloud predictions; help to create the Ultraviolet Index, a guide to safe levels of sunlight exposure. OMPS has two sensors, both new designs, and three advanced hyperspectral-imaging spectrometers.

Mission System Architecture



NPP Orbit Path

NPP's polar orbit, combined with the Earth's rotation, allows it to view the entire Earth's surface twice every 24 hours and takes the spectrum of measurements required for observing environmental events, short-term weather forecasting and creating long-term data records. The study of Earth system science requires observing a series of interconnected events. Because NPP surveys a va-



riety of data, it helps us get a sense of the bigger picture. For example, sea surface temperature changes can affect the amount of moisture in the atmosphere, which can change the weather, which can change land use, which can change the amount of dust in our atmosphere.

Environmental Data Records and Science Data Products

• VIIRS

- Imagery
- Sea Surface Temperature
- Aerosol Optical Thickness
- Aerosol Particle Size
- Suspended Matter
- Cloud Base Height
- Cloud Cover/Layers
- Cloud Effective Particle Size
- Cloud Optical Thickness
- Cloud Top Height
- Cloud Top Pressure
- Cloud Top Temperature
- Albedo (Surface)
- Land Surface Temperature
- Vegetation Index
- Snow Cover/Depth
- Surface Type
- Ice Surface Temperature
- Ocean Color/Chlorophyll

- Sea Ice Characterization
- Active Fire Products

• CrIS/ATMS

- Atmospheric Temperature Profile
- Atmospheric Humidity Profile
- Pressure

• OMPS

- Total Column Ozone
- Ozone Profile

• CERES

- Net Solar Radiation (TOA)
- Outgoing Longwave Radiation (TOA)
- Downward Longwave Radiation (Sfc)
- Downward Shortwave Radiation (Sfc)

NPP Launch Vehicle

The NPP satellite will be launched from Vandenberg Air Force Base, California, on a Delta II-7920-10 launch vehicle.

The NPP mission will be launched into a 824 km circular, sun-synchronous polar orbit with a 1:30 p.m. local-time ascending node crossing.

KSC Range Services at Vandenberg AFB provides the integration facilities, launch pad services, electrical power, communication links, and range commanding required to process, erect, fuel, and launch the NPP spacecraft and its associated launch vehicle. During launch and early operations, NPP communicates through the Tracking and Data Relay Satellite System (TDRSS).



For more information, please visit our web site at: <http://npp.gsfc.nasa.gov/>



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NASA Facts